

**WHAT IS CLAIMED IS:**

1. A method of improving a characteristic of an image according to its material content, said method comprising the steps of:
  - providing an image comprised of image pixels;
  - generating a belief map corresponding spatially to the image pixels, wherein the belief map includes belief values indicating the likelihood that respective pixels are representative of a particular material;
  - generating an improvement parameter from the belief values of the belief map, wherein the improvement parameter is proportional to the belief values and applied uniformly to the image pixels; and
  - using the improvement parameter to improve the characteristic of the image.
2. The method as claimed in claim 1 wherein the characteristic is sharpness and the improvement parameter is a sharpening parameter.
3. The method as claimed in claim 2 wherein the step of using the improvement parameter comprises performing sharpening with an unsharp mask operation.
4. The method as claimed in claim 3 wherein the sharpening parameter is a scale factor used in the unsharp mask operation.
5. The method as claimed in claim 1 wherein the characteristic is noise and the improvement parameter is a noise parameter.
6. The method as claimed in claim 5 wherein the step of using the improvement parameter comprises performing noise reduction with a sigma filter.

7. The method as claimed in claim 1 wherein the step of generating a belief map comprises the steps of:

detecting pixels that represent the particular material; and  
producing a belief map from the detected pixels.

8. The method as claimed in claim 1 wherein the particular material is selected from the group including faces, flesh, sky and vegetation and the improvement parameter conditions the amount of improvement upon a characteristic of the belief values in the belief map that represent the particular material.

9. The method as claimed in claim 1 wherein the improvement parameter is proportional to a maximum belief value.

10. The method as claimed in claim 1 wherein the improvement parameter is proportional to an average belief value.

11. The method as claimed in claim 1 wherein the belief values are grouped spatially into different sized regions of similar belief values and the improvement parameter is proportional to the size of at least one of the regions.

12. The method as claimed in claim 1 wherein the belief map is generated from a low resolution version of the image.

13. The method as claimed in claim 1 wherein the belief map is generated from a sub-sampled version of the image.

14. The method as claimed in claim 1 wherein the image is a color image comprised of a plurality of separate signal channels and the belief map is generated from a selected signal channel.

15. A computer program product for performing the method claimed in claim 1.

16. A method of improving the sharpness of an image according to its material content, said method comprising the steps of:  
    providing an image comprised of image pixels;  
    generating a belief map corresponding spatially to the image pixels, wherein the belief map includes belief values indicating the likelihood that respective pixels are representative of a particular material;  
    generating a sharpening parameter from the belief map, wherein the sharpening parameter is applied uniformly to the image pixels; and  
    using the sharpening parameter to sharpen the image.

17. The method as claimed in claim 16 wherein the particular material is flesh and the sharpening parameter conditions the amount of sharpening upon a characteristic of the belief values in the belief map that represent flesh.

18. The method as claimed in claim 17 wherein the step of generating a belief map comprises the steps of:  
    detecting pixels that represent flesh; and  
    producing a belief map from the detected pixels.

19. The method as claimed in claim 12 wherein the belief values are grouped spatially into different sized regions of similar belief values and the value of the sharpening parameter is proportional to the size of at least one of the regions.

20. A system for improving a characteristic of an image according to its material content, said system comprising:  
    an image generator providing an image comprised of image pixels;

a material detector generating a belief map corresponding spatially to the image pixels, wherein the belief map includes belief values indicating the likelihood that respective pixels are representative of a particular material;

a map analyzer generating an improvement parameter from the belief values of the belief map, wherein the improvement parameter is proportional to a characteristic of the belief values and applied uniformly to the image pixels; and

a processor using the improvement parameter to improve the characteristic of the image.

21. The system as claimed in claim 20 wherein the characteristic is sharpness and the improvement parameter is a sharpening parameter.

22. The system as claimed in claim 20 wherein the characteristic is noise and the improvement parameter is a noise parameter.

23. The system as claimed in claim 20 wherein the material detector detects pixels that represent the particular material and produces a belief map from the detected pixels.

24. The system as claimed in claim 20 wherein the particular material is selected from the group including faces, flesh, sky and vegetation and the map analyzer conditions a value of the improvement parameter upon a characteristic of the belief values in the belief map that represent the particular material.

25. The system as claimed in claim 24 wherein the value of the improvement parameter is proportional to a maximum belief value.

26. The system as claimed in claim 24 wherein the value of the improvement parameter is proportional to an average belief value.

27. The system as claimed in claim 24 wherein the belief values are grouped spatially into different sized regions of similar belief values and the value of the improvement parameter is proportional to the size of at least one of the regions.

28. The system as claimed in claim 20 wherein the image generator provides a low resolution version of the image and the belief map is generated from the low resolution version.

29. The system as claimed in claim 20 wherein the image generator provides a sub-sampled version of the image and the belief map is generated from the sub-sampled version.

30. The system as claimed in claim 20 wherein the image generator provides a color image comprised of a plurality of separate signal channels and the belief map is generated from a selected signal channel.